

日本産ワセンチュウ科の分類学的研究

誌名	農業環境技術研究所報告
ISSN	09119450
著者	皆川, 望
巻/号	1号
掲載ページ	p. 95-126
発行年月	1986年3月

農林水産省 農林水産技術会議事務局筑波事務所
Tsukuba Office, Agriculture, Forestry and Fisheries Research Council Secretariat



Taxonomic Studies of Criconematidae (Nematoda: Tylenchida) of Japan

I. Genera *Neolobocriconema*, *Paralobocriconema* N. Gen. and *Macrocriconema* N. Gen.

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(Received October 31, 1985)

Synopsis

A new species of *Neolobocriconema* was described, and two new genera were proposed. *Neolobocriconema hirakuraense* n. sp. differs from *N. laterale* by the presence of a longer body, a larger number of body annules, more posterior location of anus of the female, and the presence of a male. *Neolobocriconema* was redefined as having spherical submedian lobes, continuous cuticular fringes of body ornamentation in the female, and membranous body scales in the juvenile stages. The designation of *Paralobocriconema* n. gen. was proposed for the other five species of *Neolobocriconema* (s. l.) having such characteristics as coarsely crenate body annules, moderately developed submedian lobes in the female adult, tuberos cloaca in the male adult, and smooth scales in the fourth- and third-stage juveniles. Intraspecific variations of the Japanese populations of *P. serratum* (KHAN & SIDDIQI, 1963) n. comb., the type species of the new genus, and *P. aberrans* (JAIRAJPURI & SIDDIQI, 1963) n. comb. from Nagano were redescribed. *Macrocriconema* n. gen. was identified and described as a closely related genus of *Neolobocriconema* (s. str.), which included the type and only species of *M. querci* (CHOI & GERAERT, 1975) n. comb. (= *Criconema querci*). This new genus can be distinguished from *Neolobocriconema* (s. str.) by the longitudinally arranged body scales of the female, and the irregular length and shape of the membranous scales of the juveniles.

Introduction

Species of the family Criconematidae show unique features among the soil nematodes due to the presence of coarse annules sometimes ornamented with crenations, scales, spines or membranous appendages; stout bodies; strong stylets; distinctive sexual dimorphism; and metamorphosis with developmental stages. They are ectoparasites of plants, and distribute in various habitats, being mainly associated with perennial plants, such as forest trees, fruit trees, and herbaceous plants of grasslands. Some species which also be recovered from annual plants, are known as pests of field crops. In Japan, although a large number of these organisms have been detected in a wide range of habitats, their fauna has not been adequately studied up to the present time. In this series, some known and several new species of this family will be described and illustrated by drawings and by SEM photographs for the accurate identification

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of the Japanese species. This first part includes the investigations about the *Neolobocriconema* group, along with proposals of two new genera and a description of a new species.

Neolobocriconema serratum (KHAN & SIDDIQI, 1963) was obtained from herbaceous and woody plants in Honshu, Shikoku and Kyushu. Although only female adults were present in most populations, males occurred in the population of Mt. Aso, Kumamoto Prefecture. Recently a large criconematid nematode has been collected in Mie Prefecture including juvenile stages and males. This species is closely related to *Neolobocriconema laterale* (KHAN & SIDDIQI, 1963), the type species of this genus. The juveniles of the Japanese species have distinct features consisting of the presence of membranous body scales, and they lack the spiny scales of the *N. serratum* group. Based on these characters, it can be concluded that the species of *Neolobocriconema* at the exclusion of *N. laterale* belong to another genus and they were thus assigned to the new genus *Paralobocriconema*, as proposed in this paper.

Criconema querci CHOI & GERAERT, 1975 which was originally described in Korea, was also recorded in Japan (TOIDA & MOMOTA, 1981). This species was transferred to the genera of *Ogma*, *Crossonema* and *Variasquamata* (ANDRÁSSY, 1979; EBSARY, 1981; TOIDA & MOMOTA, 1981). Morphological characteristics of the juvenile stages indicate a close relationship between this species and those of *Neolobocriconema* (s. str.). Female adults of these two species have a large and stout body, prominent submedian lobes, and lobed scales of the posterior terminus. However, the shape and arrangement of the body scales of both female adult and juvenile stages are different, hence a new genus *Macrocriconema* is proposed for this organism.

Materials and Methods

The nematodes were extracted from soil samples by using the double-layer centrifugal-floatation method (TAKAGI, 1970; MINAGAWA, 1979) after treatment by sieving. They were subjected to moderate heat, fixed by TAF fixative, and mounted in glycerin after slow dehydration for the light microscope observation. For observation by scanning electron microscope (SEM), preserved fixed specimens by TAF were transferred to a gradient series of ethanol ranging from 50% to 100% for dehydration. They were dried in liquid CO₂ using a critical-point dryer from pure ethanol, and coated with a thin layer of Platinum-Vanadium. The specimens thus prepared were observed by SEM (Hitachi X-6500) at 20 kV.

Abbreviations used mainly in the tables are as follows: n = number of specimens examined; L = overall body length; a = "L" divided by greatest body width excluding spines; a' = "L" divided by greatest body width including spines; b = "L" divided by esophagus length from the anterior end of the body to the esophageal-intestinal valve; c = "L" divided by length of tail (from anus to posterior end of body); V = distance of vulva from the anterior end of the body divided by "L" (%); R = total number of body annules; RV = number of annules from the vulva to the posterior end of body; Ran = number of annules from the anus to the posterior end of body; RVan = number of annules between vulva and anus; Rex = number of annules from the excretory pore to the anterior end of body; RSt = number of annules from the anterior end of body to the level of stylet end; ROes = number of annules from the anterior end of body to the level of esophagus terminus; St. K. H. = stylet K. height; St. K. W. =

stylet knob width; Ex. pore = distance from the excretory pore to the anterior end of body; T = overall testis length divided by "L" (%); genit. prim. = genital primordium; and s. d. = standard deviation.

Results and Discussion

Genus *NEOLOBOCRICONEMA* MEHTA & RASKI, 1971

DIAGNOSIS (amended). *Female*: Body large, 0.55-0.89 mm, plump with 37-50 annules. Body annules with small fringes of cuticular outgrowth on the posterior margin. Head annule one. Lip region elevated. Submedian lobes spherical and distinctly prominent. Stylet rigid, 107-140 μ m, knobs anchor-shaped. Vulva closed. Tail one to three annules, terminus round. Appendages of posterior body lobed; palmate or irregular shape. *Male*: Body slender, arched. Cloaca prominent. Lateral field with four incisures. Bursa well developed. Spicules long and arch shaped, gubernaculum simple rod-like. *Juveniles* (fourth stage). Body stout with membranous appendages on the posterior margin of annules arranged in 13-15 longitudinal rows. Appendages rectangular, not divided into fringe or with spines at tips. First head annule divided into eight sectors in the outer margin. Submedian lobes prominent. Tail conical. Fourth-stage male juvenile without stylet.

TYPE SPECIES.

N. laterale (KHAN & SIDDIQI, 1963) MEHTA & RASKI, 1971

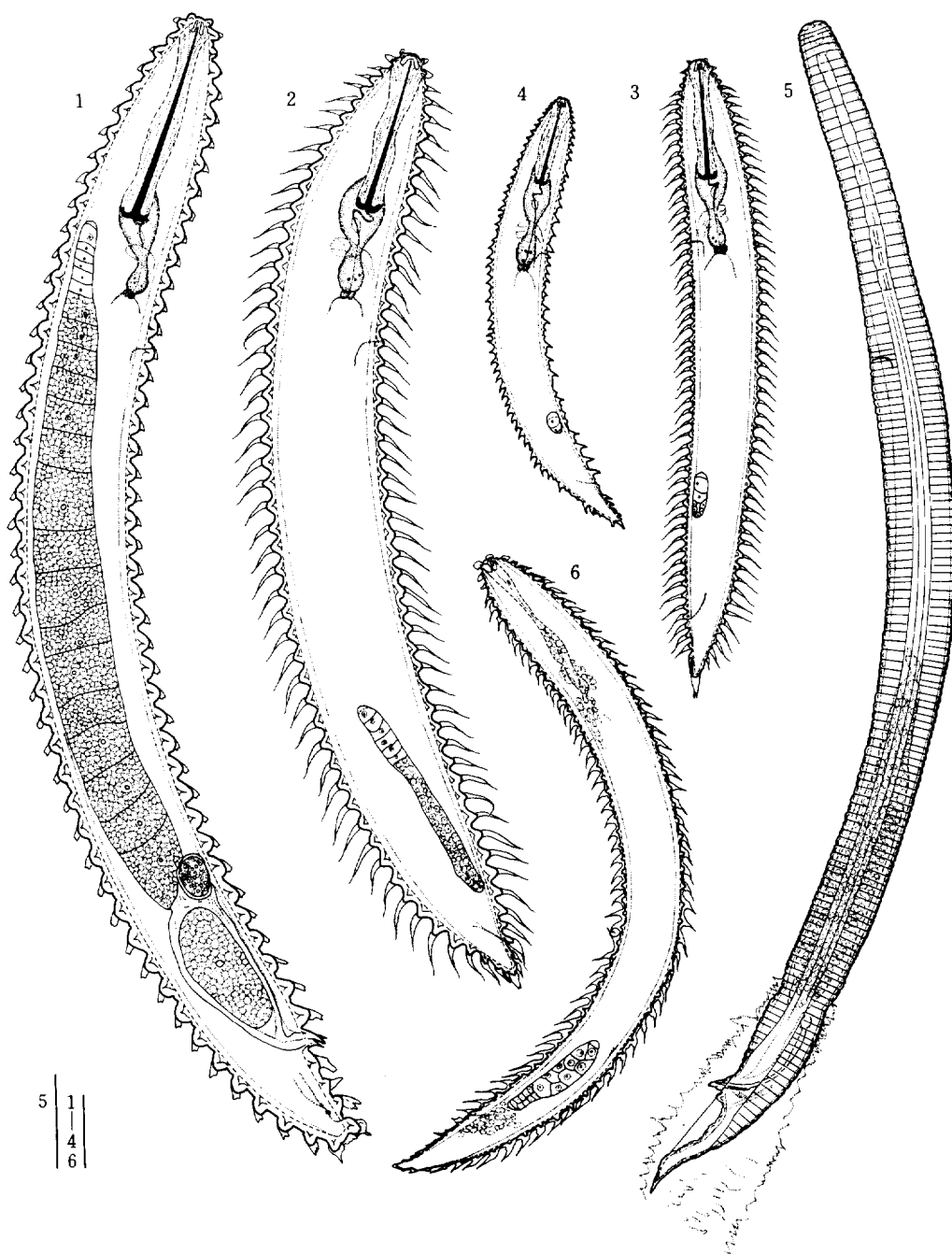
KHAN & SIDDIQI, 1963a, p. 584-586, figs. 1 A-F (*Criconema*); DE GRISSE & LOOF, 1965, p. 593 (*Lobocriconema*); RASKI & GOLDEN, 1966, p. 59 (*Criconemoides*); DE GRISSE, 1968, p. 119, figs. XXIII 24-27 (*Lobocriconema*); MEHTA & RASKI, 1971, p. 194; ANDRÁSSY, 1979, p. 29.

OTHER SPECIES. *N. hirakuraense* n. sp.

REMARKS. *Neolobocriconema* (*s. str.*) is most closely related to *Macrocriconema* n. gen. (in this article) due to the presence of a large and stout body, prominent spherical submedian lobes, and membranous scales in the juvenile stages, but can be distinguished from it by the shape and arrangement of body appendages on body annules in the female adult. This genus also resembles the *Paralobocriconema* n. gen. (in this article) by the ornamentation of body annules. However, the latter differs from *Neolobocriconema* (*s. str.*) in the discoid submedian lobes, and round or rectangular scales on body annules of the juvenile stages. Based on the characteristics of the juvenile stages of *N. hirakuraense* n. sp., the species other than the present species and *N. laterale* could be included in the separate genus of *Neolobocriconema*. The genus *Paralobocriconema* is proposed for these five species. Recently *Merocriconema* was synonymized with *Neolobocriconema* (*s. l.*) (HASHIM, 1984), but these two genera are considered to be independent. Details are discussed in the diagnosis of the next genus.

Key to species of *Neolobocriconema* :

1. Body annules 37 to 41; body length 550-750 μ m; excretory pore located at 12th to 14th annule from anterior end; anus at 3rd annule from terminus; male absent *N. laterale*



Figs. 1-6 *Neolobocriconema hirakuraense* n. sp. 1, female adult; 2, fourth-stage juvenile (female); 3, third-stage juvenile (do.); 4, second-stage juvenile (do.); 5, male adult; 6, fourth-stage juvenile (male). Scales indicate 50 μ m.

- Body annules 45 to 50; body length 734-890 μm ; excretory pore located at 14th to 17th annule from anterior end; anus at terminal or its preceding annule; male present
 *N. hirakuraense*

NEOLOBOCRICONEMA HIRAKURAENSE N. SP.

(Figs. 1-6, 25-35)

DESCRIPTIONS. *Female adult* (Figs. 1, 25-29; Table 1). Body cylindrical and plump, slightly curved ventrally after treatment by gentle heat. Head annule one, 33.0-41.2 μm (37.4 ± 2.1 : mean \pm s. d., $n = 25$) across, emarginated by narrow ridge around the outer margin, which is occasionally intercepted in the lateral portion. Lip region elevated, oral disc rectangular, submedian lobe spherical and prominent, lateral lobe semicircular. Stylet rigid, knobs anchor shaped. Body annules coarse, posterior edge ornamented by continuous small fringe of membranous cuticle. Anterior three or four annules of vulva with palmate scales arranged in eight longitudinal rows. Vulva closed, anterior lip rectangular with conical projections at the front edges, posterior lip triangular. Anus at terminal annule or second annule from terminus. Ornamentation of fringes in tail annule(s) longer than that of body annules and occasionally irregular in shape.

Male adult (Fig. 5; Table 1). Body cylindrical, tapers to round head, and conical tail part, curved ventrally after treatment by gentle heat. Head smooth, round. Stylet absent. Excretory pore at four annules posterior to hemizonid. Body annules 3.7-4.3 μm (3.9: mean, $n=3$) wide around the midbody. Tail elongate conical, the terminus roundly pointed. Spicules arch shaped, gubernaculum crescent, small. Cloacal prominence distinct. Bursa developed. Lateral field 6.7-9.3 μm (8.2) wide, with four incisures, inner pair occasionally obscure.

Fourth-stage juvenile, female (Figs. 2, 30-34; Table 2). Body stout, gradually tapering to truncate head end and conical tail terminus. Annules round, with 12 to 14 round scales in midbody, which are hardly observed from front by a light microscope, arranged in longitudinal rows. The tip of each scale bears a thin cuticular outgrowth of elongate rectangular shape, 14.7-22.7 μm (19.1: mean, $n = 10$) in length, with increasing length in the posterior half of body especially tail terminus. Lip region dome-like shaped; submedian lobes round and prominent. Head annule one, divided into eight sectors in outer margin. Stylet rigid, knobs anchor-shaped. Genital primordium long. Tail three or four annules, 14.7-26.7 μm (20.8) in length.

Fourth-stage juvenile, male (Fig. 6; Table 2). Body curved ventrally after treatment by gentle heat, tapering to rounded head and conical tail. Annules round, with inconspicuous round scales arranged in 9 to 12 (mean = 10, $n = 10$) longitudinal rows around midbody. Cuticular appendages of scales varying in length, occasionally completely absent, usually shorter than female's, 3.3-14.0 μm in length; tail terminus without distinct cuticular outgrowth. Head annule one, with prominent submedian lobes. Stylet absent. Esophagus narrow and obscure. Excretory pore at three to five annules posterior to esophagus end. Genital primordium stouter than that of female. Tail 13 to 15 annules, conical.

Third-stage juvenile (Fig. 3; Table 2). General shape similar to that of female fourth-

stage juvenile, but body shorter, cuticular outgrowths of body scales less developed, larger number of body annules, shorter stylet, more tail annules, and less developed and oval genital primordium.

Second-stage juvenile (Figs. 4, 35; Table 2). Body curved ventrally after treatment by gentle heat, with triangular spines of ca. 6 μm , which arranged in scattered longitudinal rows. Head truncate in front, with three annules; first one 9.3-11.3 μm (10.2; mean, $n = 10$) in diameter, second 11.3-15.0 μm (12.8) and third 14.7-17.3 μm (15.7). Stylet rigid, knobs anchor shaped. Tail conical with 6 to 9 annules; terminus roundly pointed. Genital primordium oval.

TYPE SPECIMENS. Holotype (female) and paratypes (150 females, 3 males and 100 juveniles). Holotype is deposited in the Herbarium and Insect Museum of the National Institute of Agro-Environmental Sciences (NIAES), Yatabe, Ibaraki, Japan. Paratypes will be distributed to the following institutes: USDA Nematode Collection, Beltsville, Maryland, USA (10 females and 5 juveniles); University of California, Nematode Survey Collection, Davis, California, USA (10 females and 5 juveniles); Nematology Department, Rothamsted Experimental Station, Harpenden, Herts., England (5 females and 5 juveniles); Commonwealth Institute of Parasitology, St. Albans, England (5 females and 5 juveniles); Department of Nematology, Wageningen Agricultural University, Wagenindend, The Netherlands (10 females and 5 juveniles); Institute voor Dierkunde, Rijksuniversiteit Gent, Gent, Belgium (10 female and 5 juveniles); and Laboratoire des Vers, Muséum National d'Histoire Naturelle, Paris, France (10 females and 5 juveniles). Remaining specimens presented at NIAES.

TYPE HABITAT AND LOCALITY. Specimens were collected from the following plants in the Mie University Forest, Hirakura, Misugi, Mie, Japan: *Pieris japonica* (THUNB.) D. DON., *Fagara ailanthoides* (SIEB. et ZUCC.) ENGLER, *Quercus mongolica* FISCHER ex TURCZ. var. *grosserrata* (BL.) REHDER et WILSON, *Quercus* sp. and *Acer* sp.

DIAGNOSIS. *Neolobocriconema hirakuraense* n. sp. is closely related to *N. laterale* (KHAN & SIDDIQI, 1963) MEHTA & RASKI, 1971, the type species of this genus, but can be distinguished from it by the presence of a longer body, larger number of body annules, more posterior location of excretory pore and anus in the female, and presence of a male.

PARALOBOCRICONEMA N. GEN.

DIAGNOSIS. *Female*: Body 0.34-0.64 mm, annules 39-46, strongly crenate, distinct especially on tail which may also have lobes. Head annules one or two. Lip region elevated. Submedian lobes round, moderately developed. Stylet 68-102 μm . Vulva closed. Tail two or three annules, rounded conical. *Male*: Lateral incisures four, bursa moderately developed. Cloacal prominence distinct, knob-like shape. *Juvenile* (fourth stage): Annules with 8-16 longitudinal rows of smooth scales. Male juveniles without stylets.

TYPE SPECIES.

Paralobocriconema serratum (KHAN & SIDDIQI, 1963) n. comb.

KHAN & SIDDIQI, 1963b, p. 414-415, figs. 1-8 (*Criconema*); DE GRISSE & LOOF, 1965, p. 593

(*Lobocriconema*); RASKI & GOLDEN, 1966, p. 557 (*Criconemoides*); DE GRISSE, 1967, p. 80, 83 (*Lobocriconema*); DE GRISSE, 1968, p. 120, figs. XXIII 1-13, LXV 1, LXXV, CXV, CXLI 1 (*Lobocriconema*); MEHTA & RASKI, 1971, p. 194 (*Neolobocriconema*); ANDRÁSSY, 1979, p. 29-30 (*Neolobocriconema*); EBSARY, 1981b, p. 1233-4, figs. 3 A-D (*Neolobocriconema*); TOIDA & MOMOTA, 1981, p. 29-30, figs. 2 F-K (*Neolobocriconema*).

Syn. *Criconema sulcatum* GOLDEN & FRIEDMAN, 1964, p. 48-50, figs. 2 A-G; DE GRISSE & LOOF, 1965, p. 593 (*Lobocriconema*); RASKI & GOLDEN, 1966, p. 559 (*Criconemoides*); DE GRISSE, 1967, p. 80 (nec.).

OTHER SPECIES.

P. aberrans (JAIRAJPURI & SIDDIQI, 1963) n. comb.

JAIRAJPURI & SIDDIQI, 1963, p. 341-343, figs. 1-6 (*Criconemoides*); DE GRISSE & LOOF, 1965, p. 593 (*Lobocriconema*); DE GRISSE, 1968, p. 118, figs. XXIII 20-23, LXIII 1, LXXII 78, LXXIII 13, CXXIII (*Lobocriconema*); ANDRÁSSY, 1979, p. 29 (*Neolobocriconema*); EBSARY, 1981b, p. 1233 (*Neolobocriconema*).

P. cataracticum (ANDRÁSSY, 1979) n. comb.

ANDRÁSSY, 1979, p. 30-33, figs. 4 A-D, 5 A-C (*Neolobocriconema*); EBSARY, 1981b, p. 1233 (*Neolobocriconema*).

P. insulicum (CHOI & GERAERT, 1975) n. comb.

CHOI & GERAERT, 1975, p. 47-49, figs. 7 A-J (*Neolobocriconema*); ANDRÁSSY, 1979, p. 29 (*Neolobocriconema*); EBSARY, 1981b, p. 106 (*Crossonema*).

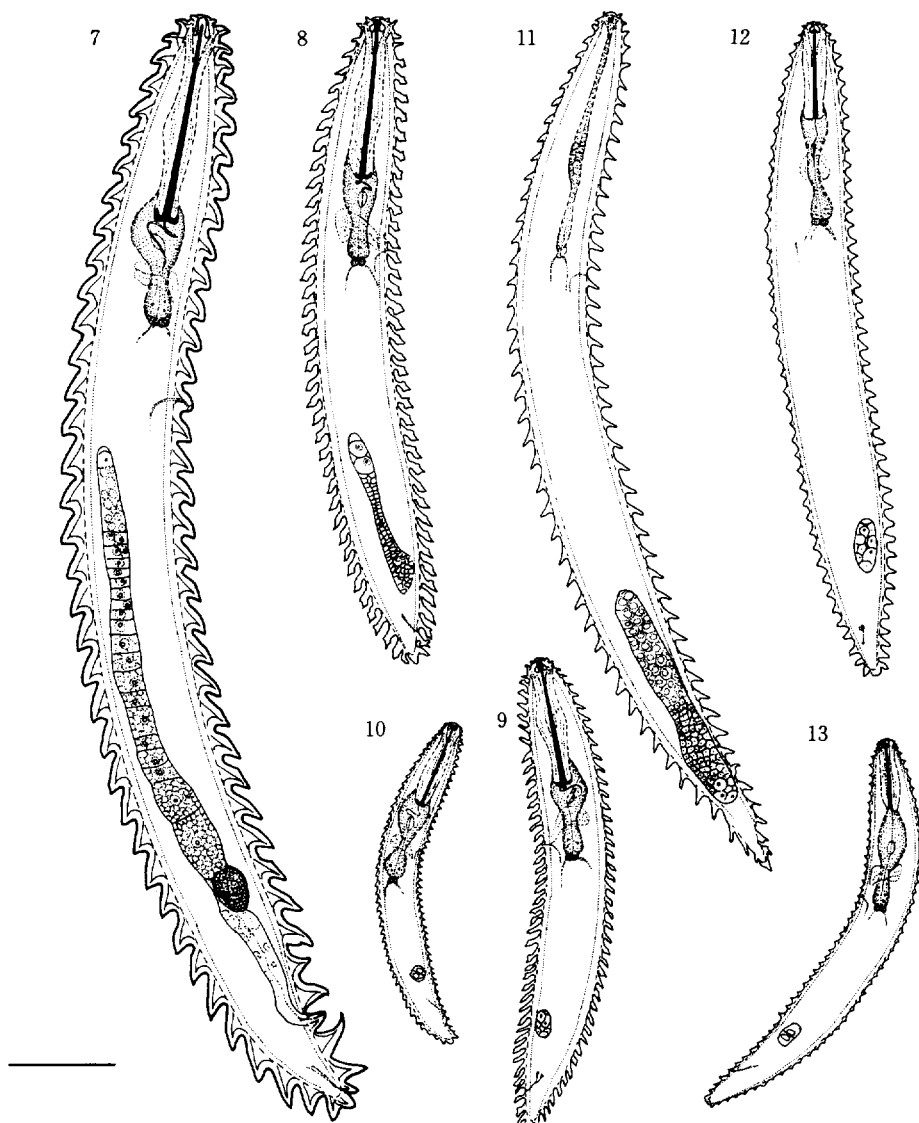
P. olearum (HASHIM, 1984) n. comb.

HASHIM, 1984, p. 71-73, figs. 1 A-H (*Neolobocriconema*).

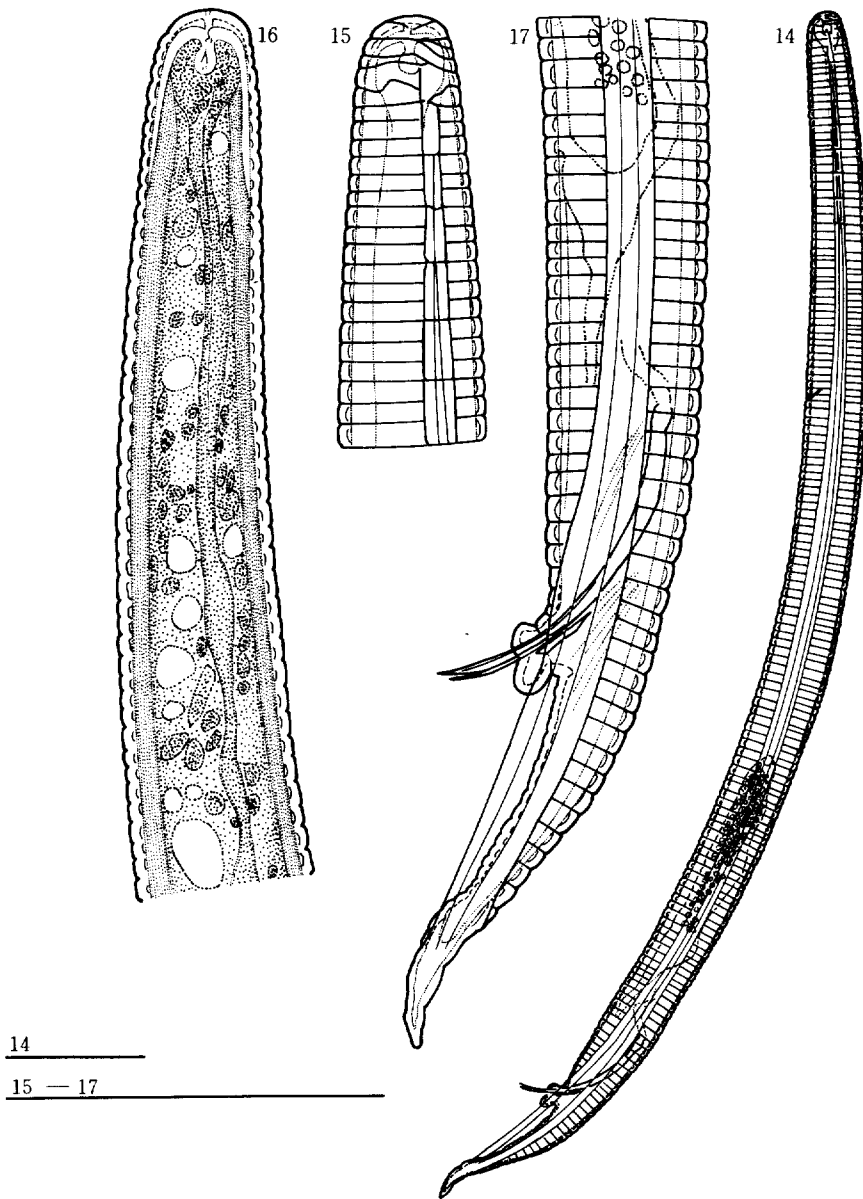
REMARKS. *Paralobocriconema* n. gen. differs from *Lobocriconema* by the presence of coarsely crenate body annules especially on the tail region in the female instead of smooth to finely crenate annules in the latter. This new genus is also related to *Neolobocriconema* (s. str.) but can be separated from it by the moderately developed submedian lobes in the female and smooth scales in the juvenile stages. Although HASHIM (1984) treated *Merocriconema* as a junior synonym of *Neolobocriconema* (s. l.), the former can be separated from the latter by the smaller size of submedian lobes, smooth edge of body annules in anterior body, and irregular shape of juvenile scales.

Key to species of *Paralobocriconema* :

1. Posterior margins of body annules with lobes arranged in 12-16 longitudinal rows at midbody 2.
- Posterior margins of body annules without longitudinally arranged lobes 3.
2. Body annules 48 to 52; stylet length 73-75 μm *P. insulicum*
- Body annules 34 to 38; stylet length 81.6-96 μm *P. serratum*
3. Stylet length 94-102 μm *P. cataracticum*
- Stylet length less than 92 μm 4.
4. Second and third head annules of approximately equal diameters which are greater than that of the first one *P. olearum*



Figs. 7-13. *Parolobocriconema serratum* (KHAN & SIDDIQI, 1963) n. comb. (population of Mt. Aso, Kumamoto). 7, female adult; 8, fourth-stage juvenile (female); 9, third-stage juvenile (do.); 10, second-stage juvenile (do.); 11, fourth-stage juvenile (male); 12, third-stage juvenile (male, latero-ventral portion); 13, second-stage juvenile (male). Scale indicates 50 μ m.



Figs. 14-17. *Paralobocriconema serratum* (KHAN & SIDDIQI, 1963) n. comb. (population of Mt. Aso, Kumamoto), male adult. 14, general view; 15, anterior body (external); 16, do. (internal); 17, posterior body (external). Scales indicate 50 μ m.

Second head annule markedly narrower than either the first or succeeding annules
 *P. aberrans*

PARALOBOCRICONEMA SERRATUM (KHAN & SIDDIQI, 1963) N. COMB.

(Figs. 7-17, 36-49.)

DESCRIPTIONS (Population from Mt. Aso). *Female adult* (Figs. 7, 36-41; Table 3). Body stout, annules coarse. Head annule usually one, occasionally two, in this case diameter of first one smaller than that of the second; divided into four sectors, outer margin smooth but wavy. Submedian lobes discoid, prominent. Body annules striated and serrate at posterior edge. Annules of anterior body bluntly angled, twelve in number; of midbody with small lobe, ten in number arranged in longitudinal rows; and of posterior body with developed lobes, ten in number at each posterior edge, lobes elongated and modified in tail and around the vulval part of body. Stylet rigid, knobs anchor shaped. Ovary outstretched, with terminus seldom curved posteriorly. The females of Mt. Aso population have developed spermathecae filled with round spermatozoa, but those of the other populations bear undeveloped and empty spermathecae. Vulva at fourth to sixth annule from terminus, anterior lip simple, posterior one prominent laterally and developed. Anus at terminal or preceding annual of the tail.

Male adult (Figs. 14-17; Table 4). Body cylindrical. Esophagus degenerate and slender, 98.3-113.3 μm (107.9: mean, $n = 10$) long. Hemizonid posterior to esophagus end. Excretory duct directed forwardly at beginning. Testis one, outstretched. Spicules long and arched, gubernaculum simple, rod like. Cloaca tuberos, distinctly prominent. Bursa well developed. Tail elongate conical, terminus bluntly pointed. Body annules 2.7-3.5 μm apart around midbody. Lateral field originating near the lip region, areolated at beginning, with four incisures.

Fourth-stage juvenile, female (Figs. 8, 42, 43, 46; Table 4). Body stout and scaled, arranged in 8 to 11 longitudinal rows around midbody. Body scales square to round, with two or three short notches at the front edge. Head annule forwardly directed, divided into four sectors, outer margin crenate. Submedian lobes discoid. Stylet rigid, knobs anchor-shaped. Excretory pore at the level of same or few annules posterior to esophagus end. Genital primordium long. Anus at two to four annules, mostly three, from the tail terminus. Scales around tail elongated.

Fourth-stage juvenile, male (Figs. 11, 44, 45; Table 4). Body longer and slender than that of female juvenile. Body scales arranged in 9 to 10, mostly 10 longitudinal rows like in female juvenile, but scales are smaller and more round. Head annule crenate, submedian lobes prominent. Stylet absent. Esophagus degenerate as in male adult. Excretory pore at three to five annules posterior to esophagus end. Genital primordium stouter than that of female. Tail longer than that of female, 30.7-52.0 μm (42.4: mean, $n = 10$) in length.

Third-stage juvenile, female (Figs. 8, 47; Table 4). General shape similar to that of female fourth-stage juvenile but scales less developed. First head annule crenate, submedian lobes prominent. First body annule also crenate. Stylet rigid, knobs anchor-shaped. Excretory pore at around the level of esophagus end, immediately posterior to hemizonid. Genital primordium

oval. Body scales of tail region elongated. Tail terminus bluntly pointed.

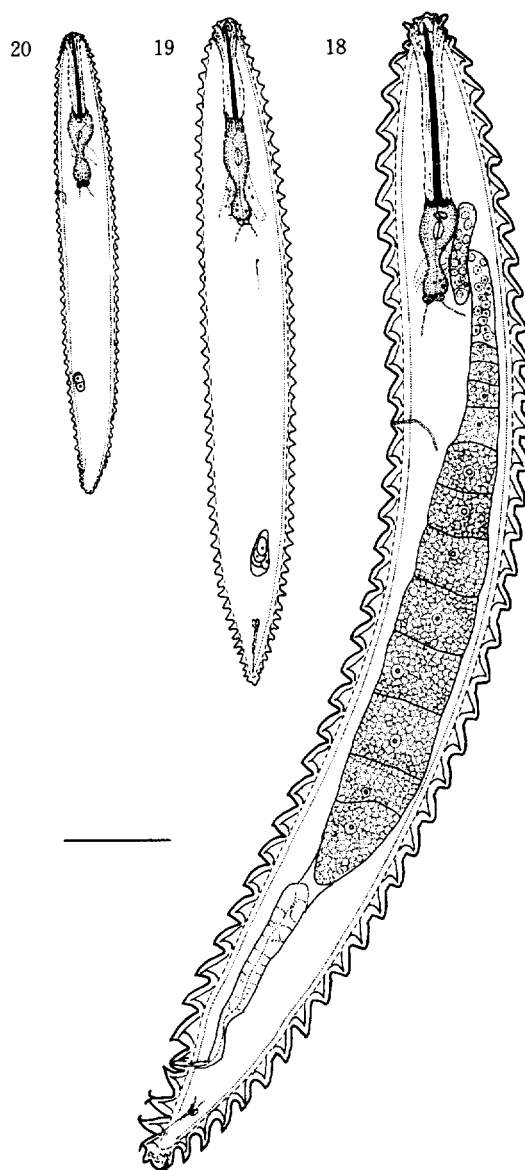
Third-stage juvenile, male ? (Fig. 12; Table 4). Two juveniles which seemed to be at the third stage based on the size of their genital primordium and prorhabdion length have conical parts of stylets but no stylet shafts and knobs. They are considered to be male juveniles. Body longer and slender than that of the female juvenile; esophagus less developed and prorhabdion rather shorter; genital primordium elongate oval; and scale rows eight.

Second-stage juvenile, female (Figs. 10, 48, 49; Table 4). Body stout, annules rough and coarsely crenate, but not scaled. Head annules undifferentiated from body ones. Stylet rigid, knobs anchor shaped. Excretory pore at around the level of nerve ring. Genital primordium round or long oval. Posterior edge of tail annules ornamented with minute fringes.

Second-stage juvenile, male ? (Fig. 13; Table 4). Similar features to those of the third-stage juvenile, two individuals without stylet shafts and knobs were obtained. The shape of their body annules, and sizes and morphology of the genital primordium indicate that they are second-stage juveniles. General shape and feature of body annules similar to those of female juvenile, but body longer; and genital primordium larger.

DISTRIBUTION AND HOST PLANTS. *P. serratum* n. comb. was detected from soil around roots of the following plants and localities: *Scripus uichurai* BOCKLER, f. *concolor* (MAXIM.) T. KOYAMA, *Miscanthus sinensis* ANDERSS., *Buxus microphylla* SIEB. et ZUCC. var. *japonica* (MUELL. ARG.) REHD. et WILS., *Acer sieboldianum* MIQ., *Quercus serrata* MURRAY, *Q. acutissima* CARRUTHERS, and bush bamboo (*Sasa* (?) sp.) on the somma of Mt. Aso, Aso-machi, Kumamoto; mixed stands of *Zoysia japonica* STEUDEL, *Arundinella hirta* (THUNB.) C. TANAKA, *Miscanthus sinensis* ANDERSS., et al. in Kusasenri, Mt. Aso, Kumamoto; *Imperata cylindrica* (L.) P. BEAUR. var. *koenigii* (RETS.) DURAND et SCHINZ, *Miscanthus sinensis* ANDERSS., *Arthrax hispidus* MAKINO, *Eurya japonica* THUNB., and *Celtis sinensis* PERSOON in the Kyushu National Agricultural Experiment Station, Nishigoshi, Kumamoto; *Rumex* sp., and *Euonymus japonicus* THUNB. in Zentsuji, Kagawa; *Gynkyo biloba* L. in the Mie University Forest, Misugi, Mie; *Prunus* × *yedoensis* MATSUMURA and *Dactylis glomerata* L. in Yotsukaide, Chiba; *Miscanthus sinensis* ANDERSS., *Osmanthus fragrans* LOUR., *Salix* sp. and *Zelkova serrata* (THUNB.) MAKINO in the National Institute of Agro-Environmental Sciences, Yatabe, Ibaraki; *Quercus serrata* MURRAY, *Acer* sp. and *Lespedeza* sp. in the Inogashira Park, Mooka, Tochigi; *Fagara mantchurica* (BENNETT) HONDA in Mt. Fujinita, Nishi-nasuno, Tochigi; *Hemerocallis* sp. (*H. fulva* L. var. *longituba* ?), *Osmanthus heterophyllus* (G. DON) P. S. GREEN, *Prunus mume* (SIEB.) SIEB. et ZUCC. and *Camellia sinensis* (L.) O. KUNTZE in the Gunma Agricultural Experiment Station, Maebashi, Gunma; *Morus alba* (L.) in Yabutsuka-honcho, Gunma; *Prunus persica* BATSCH in Azuma-mura, Sawa-gun, Gunma; and bush bamboo (*Pleioblastus* (?) sp.) in Fujimi-mura, Gunma. Populations of the Mt. Aso and of *Miscanthus sinensis* in some localities were occurred in natural habitats, however, all the others were obtained from ornamental trees in gardens, parks, around fields, etc.

REMARKS. This species was first recorded in Japan by GOLDEN and FRIEDMAN (1964) in their description of *Criconema sulcatum*, and TOIDA and MOMOTA (1981) reported it from a mulberry field in Kumamoto. *P. serratum* which is found mainly in woody plants and also in some herbaceous plants in Japan, is fairly widely distributed in this country. Intraspecific variations



Figs. 18-20. *Parolobocriconema aberrans* (KHAN & SIDDIQI, 1963) n. comb. 18, female adult; 19, third-stage juvenile (ventral portion); 20, second-stage juvenile. Scale indicates 50 μ m.

in the measurements and dimensions were not significant among the Japanese populations, as shown in Table 3. They also corresponded with those of the Indian (KHAN & SIDDIQI, 1963b) and/or American populations (GOLDEN & FRIEDMAN, 1964).

PARALOBOCRICONEMA ABERRANS (JAIRAJPURI & SIDDIQI, 1963) N. COMB
(Figs. 18-20, 50-54.)

DESCRIPTIONS. *Female adult* (Figs. 18, 50-54; Table 5). Body stout, annules coarse and retrorse. Head annules two, rarely three, first annule forwardly directed, smooth, 20.0-30.7 μ m (26.8 ± 2.4 : mean \pm s. d., $n = 20$) diameter. Second annule distinctly smaller than the first, 18.7-27.3 μ m (26.8 ± 2.4) diameter, smooth. Submedian lobes discoid, prominent. Body annules serrate, intercepted in lateral portion of the body, lobed near and posterior to vulval part. Stylet rigid, knobs anchor-shaped. Excretory pore few annules posterior to esophagus end. Ovary well developed, occasionally reaching base of lip; usually outstretched and rarely recurved once or twice at the tip. Spermatheca round, empty. Vulva closed, vulval lip round, vagina straight. Anus usually at penultimate annule of body end. Tail end convoluted. Ventral portion of posterior vulval annules directed laterally or slightly forward. Lobes around vulva irregular in shape.

Male adult: Not found.

Fourth-stage juvenile: Not found.

Third-stage juvenile (Fig. 19; Table 5). Body elongate spindle-shaped, with round and smooth scales arranged in 10 longitudinal rows around midbody. Head annules two, first one finely crenate, 13.3 μ m diameter, second one smooth, size equal to that of the first. Stylet without shaft and knobs. Esophagus elongated. Tail conical with three annules, scales elongated. Genital primordium elongate oval.

Second-stage juvenile (Fig. 20; Table 5). Body shape similar to that of the above mentioned juvenile, but without scales. Body annules crenate at posterior edge. Head annules two, first annule smooth, and smaller than the second (6.7 μ m vs. 10.7 μ m). Stylet rigid, knobs anchor shaped. Genital primordium oval. Tail with five annules, terminus round.

DISTRIBUTION AND HOST PLANT. Soil around the root of apple (*Malus pumila* MILL.) cv. Fuji in Toyono, Nagano. Specimens were collected from the same orchard of the type locality of *Meloidogyne mali* ITO *et al.*, 1969.

REMARKS. The Japanese population has a longer stylet and smaller V-value compared with the original description from India, but the other dimensions and morphological characteristics are almost identical.

MACROCRICONEMA N. GEN.

DIAGNOSIS. *Female*: Body large and plump with 51 to 61 annules. Body annules with rectangular membranous scales arranged in 16 to 18 longitudinal rows at midbody. Head annules two. Lip region elevated. Submedian lobes spherical and prominent. Stylet rigid, knobs anchor

shaped. Vulva closed, located at 5th to 6th annules from terminus. Anus at 3rd to 5th annules from tail end. Tail roundly conical, with irregularly lobed scales. *Juveniles* (fourth stage): Annules with 11 to 15 longitudinal rows of membranous fringes varying in length and shape. *Male*: Unknown.

TYPE AND ONLY SPECIES.

Macrocriconema querci (CHOI & GERAERT, 1975) n. comb.

CHOI & GERAERT, 1975, p. 35-37, figs. 1 A-J (*Criconema* (*Variasquamata*)); ANDRÁSSY, 1979, p. 35 (*Ogma*); EBSARY, 1981a, p. 106 (*Crossonema*); TOIDA & MOMOTA, 1981, p. 31-33, figs. 5 A-J (*Variasquamata*).

REMARKS. The type and only species of this new genus which was described based on female adults from Korea, was recently transferred to the *Crossonema* MEHTA & RASKI, 1971 (EBSARY, 1981). However, the unique features of the juvenile stages suggest that it should be assigned to an independent genus different from *Criconema*, *Ogma* and/or *Crossonema*. A new genus *Macrocriconema* is thus proposed here. *Macrocriconema* n. gen. is closely related to the genus *Neolobocriconema* (s. str.) by the presence of spherical submedian lobes, but it can be distinguished from it by the longitudinal rows of body scales in female and scales of irregular form and length in the juveniles (fourth and third stages). This new genus also resembles *Bakemema* WU, 1964, but differs from it in the well developed submedian lobes and lobed membranous scales on tail; from *Neobakemema* EBSARY, 1981 by having a closed vulva and lacking the spiny scales of the juveniles.

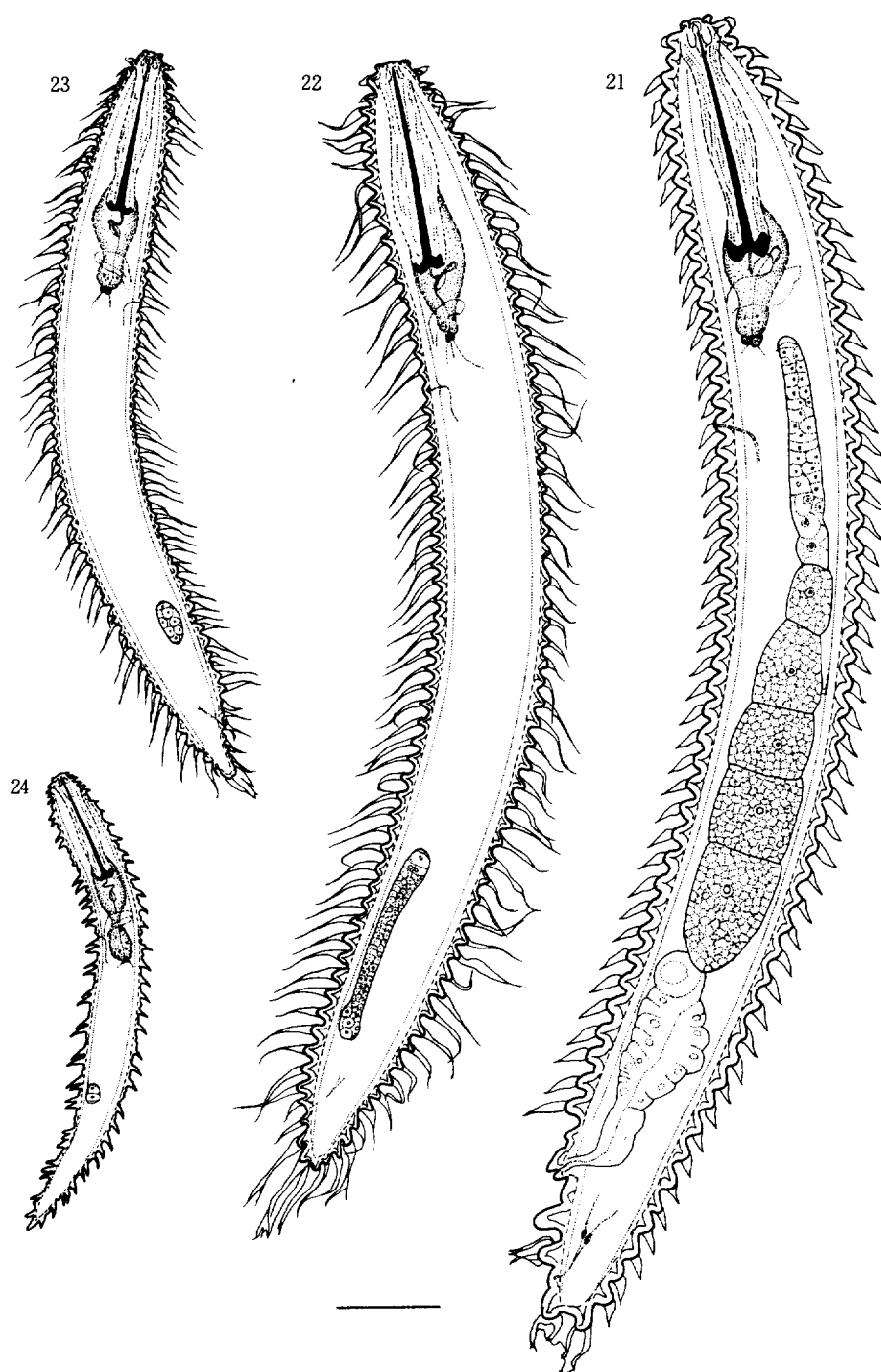
MACROCRICONEMA QUERCI (CHOI & GERAERT, 1975) N. COMB.

(Figs. 21-24, 55-69)

DESCRIPTIONS. *Female adult* (Figs. 21, 55-59; Table 6). Body cylindrical, curved ventrally after treatment by gentle heat. Cuticle thick and roughly reticulated on surface. Annules round, ornamented with scales arranged in 10 to 14, mostly 12 longitudinal rows around midbody. Head with two annules, occasionally one, set off from the body. First annule 34.6-41.2 μm (38.3 ± 1.0 : mean \pm s. d., $n = 25$) in diameter, marginated with narrow ridge, which is intercepted in lateral and ventral portions. Second one smooth, smaller than the first, 33.0-39.6 μm (35.0 ± 2.1) across. Lip region prominent, oral disk rectangular; submedian lobes well developed, spherical, ca. 5 μm in diameter; lateral lips round. Body annules with membranous and round to rectangular shaped nail-like scales. Scales around vulva and on tail elongated and lobed, terminal ones irregular in shape. Stylet rigid, knobs anchor shaped. Excretory pore 2 to 5 annules posterior to esophagus end. Ovary well developed, reaching the base of lip or stylet in some specimens, outstretched or recurved once or twice at tip in mature females. Spermatheca inconspicuous. Vulva closed; anterior lip rectangular and posterior one triangular. Vagina straight. Anus at second or third, rarely fourth annule from the terminus.

Male adult: Not found.

Fourth-stage juvenile (Figs. 22, 60-64; Table 7). Body stout, curved with membranous cuticular outgrowth, arranged in longitudinal rows. Body annules round, with 11 to 15 round



Figs. 21-24. *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb. 21, female adult; 22, fourth-stage juvenile; 23, third-stage juvenile; 24, second-stage juvenile. Scale indicates 50 μm.

scales per annule around midbody, edge of which bears 21-30 μ m long membranous outgrowth irregular in length and shape. Head annule one; outer margin divided into four sectors. Lip region similar to that of female adult. Excretory pore around the level of esophagus end. Genital primordium long. Tail 4 to 7 annules in length, rounded conical.

Third-stage juvenile (Figs. 23, 65, 66; Table 7). Similar to that of the fourth-stage juvenile, but body smaller, number of body annules larger, and cuticular outgrowth simple and less developed, 12-20 μ m long. Genital primordium elongate oval.

Second-stage juvenile (Figs. 24, 67-79; Table 7). Body curved ventrally after gentle heat treatment; tapers to rounded conical head in anterior end, and elongate conical tail in posterior one. Head annules one or two, second one larger than the first. Body annules with triangular scales roughly arranged in longitudinal rows, but scattered. Tail 4 to 7 annules, terminus pointed. Genital primordium oval.

DISTRIBUTION AND HOST PLANTS. *Macrocriconema querci* (CHOI et GERAERT, 1975) n. comb. was detected from the rhizosphere of the following plants and localities: *Acer sieboldianum* MIQ., *Prunus jamasakura* SIEB., *Rubus palmatus* THUNB. and *Styrax japonica* SIEB. et ZUCC. in the somma of Mt. Aso, Yunoura, Aso, Kumamoto; *Fraxinus longicuspis* SIEB. et ZUCC. in Hirakure, Misugi, Mie; and *Oriza japonica* THUNB. in Hikinuma, Shiobara, Tochigi.

REMARKS. This species was originally described in soil around *Quercus acutissima* in Chung Cheong Nam Do, Korea, and later reported from mulberry in Kyoto, Japan (TODA & MOMOTA, 1981). Compared with those specimens, the populations examined in this study are shorter body, but other respects of morphological characteristics are similar. The variations among the Japanese populations were insignificant (Table 6).

Acknowledgments

I wish to express my hearty thanks to Mr. Y. MOMOTA, National Agriculture Research Center, for his valuable suggestions, and T. NISHIZAWA of our institute, for his constant guidance. My thanks are also due to Messrs T. YAMAMOTO, Mie Agricultural Technical Center; F. NAKAZATO and Y. IWATA, Gunma Agricultural Experiment Station; R. IGARASHI, National Grassland Research Institute, presently at Chugoku National Agricultural Experiment Station, and Dr. Y. ITO, Nagano Fruit Tree Experiment Station, who associated me in the collections of soil samples for observations of the nematodes.

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Table 1. Measurements and dimensions of *Neolobocriconema hirakuraense* n. sp.

	Female				Male		
	Holotype	Paratypes			Paratypes		
n		25			3		
L (μm)	828	734	—890	(812 \pm 40)	557	—658	(618)
a	11.7	9.1—	12.6	(11.1 \pm 0.6)	16.4—	20.0	(17.4)
a'	7.7	7.6—	10.1	(8.9 \pm 0.6)			
b	4.3	3.8—	4.6	(4.2 \pm 0.2)	4.5—	5.1	(4.8)
c	56.3	32.7—	116.5	(52.2 \pm 18.4)	8.7—	10.5	(9.7)
c'					2.7—	3.0	(2.8)
V	91.9	91.3—	93.8	(92.4 \pm 0.7)			
R	47	45	— 50	(47.7 \pm 1.2)	153	—175	(161)
RV	5	4	— 6	(5.0 \pm 0.5)			
Ran	1	1	— 2	(1.5 \pm 0.5)	13	— 20	(16)
RVan	3	1	— 3	(2.5 \pm 0.6)			
Rex	16	14	— 17	(15.5 \pm 0.7)	34	— 43	(38)
RSt	9	8	— 10	(9.0 \pm 0.6)			
ROes	13	12	— 14	(12.6 \pm 0.6)			
Stylet (μm)	130.3	107.2—	140.2	(128.8 \pm 6.8)			
Prorhabdion (μm)	99.8	84.1—	106.4	(99.1 \pm 5.2)			
St. K. H. (μm)	7.7	6.6—	9.0	(7.6 \pm 0.8)			
St. K. W. (μm)	19.7	16.5—	21.4	(19.4 \pm 1.4)			
Ex. pore/L (%)	27.9	27.6—	30.9	(29.7 \pm 0.9)	22.7—	25.2	(23.8)
T					36.7—	41.9	(38.7)
Spicules (μm)					64.0—	79.3	(74.0)
Gubernaculum (μm)					12.0—	14.7	(13.3)

*Figures indicate minimum and maximum values, and mean or mean \pm s.d. in parentheses.Table 2. Measurements and dimensions of juvenile stages of *Neolobocriconema hirakuraense* n. sp.

Stage	Fourth stage						Third stage			Second stage		
Sex	Female			Male								
n	10			10			10			10		
L (μm)	528	—953	(608)	480	—560	(523)	368	—442	(402)	260	—313	(290)
a	8.0—	9.5	(8.9)	11.8—	15.3	(13.4)	7.1—	10.8	(9.0)	8.6—	11.5	(9.7)
a'	5.3—	6.4	(5.8)	8.7—	10.9	(10.0)	4.4—	6.5	(5.5)	6.3—	8.3	(7.1)
b	3.2—	4.0	(3.7)	4.3—	5.1	(4.6)	2.9—	3.4	(3.1)	2.4—	3.1	(2.8)
c	19.8—	40.4	(30.0)	7.9—	9.8	(8.6)	8.5—	14.5	(11.5)	7.3—	10.9	(8.8)
R	48	— 53	(50.5)	54	— 59	(55.1)	52	— 59	(55.4)	59	— 65	(61.9)
Ran	3	— 4	(3.5)	7	— 9	(7.9)	6	— 7	(6.4)	6	— 9	(7.3)
Rex	15	— 19	(16.7)	17	— 19	(17.7)	17	— 20	(18.7)	21	— 24	(22.7)
RSt	9	— 11	(10.0)				11	— 13	(11.9)	14	— 16	(14.9)
ROes	13	— 16	(14.3)	13	— 15	(13.9)	17	— 20	(18.5)	23	— 28	(24.5)
Stylet (μm)	99.0—	110.5	(104.4)				74.0—	84.0	(77.9)	52.7—	60.0	(55.6)
Prorhabdion (μm)	74.2—	95.7	(82.6)				56.0—	66.7	(59.6)	40.0—	46.0	(42.6)
St. K. H. (μm)	5.0—	6.3	(6.1)				3.7—	5.3	(4.7)	3.0—	4.7	(4.0)
St. K. W. (μm)	14.3—	18.7	(15.4)				10.3—	13.0	(11.9)	8.7—	10.0	(9.1)
Ex. pore/L (%)	27.8—	32.7	(30.4)	25.8—	29.2	(27.5)	30.9—	33.9	(32.3)	31.9—	35.6	(33.7)
Genit. Prim. (μm)	99.0—	148.5	(127.7)	73.3—	114.7	(93.1)	20.0—	42.7	(28.9)	14.0—	17.0	(15.3)
Scale rows	12	— 14	(12.6)	9	— 12	(10.3)	10	— 13	(11.6)	10	— 12	(11.4)

*Figures indicate minimum and maximum values, and mean values in parentheses.

Table 3. Measurements and dimensions of female of *Paralobocriconema serratum* (KHAN & SIDDIQI, 1963) n. comb.

Locality	Mt. Aso			Nishigoshi			Zentsuji			Yotsukaido		
	Kumamoto Pref.			Kumamoto Pref.			Kagawa Pref.			Chiba Pref.		
n	20			10			10			10		
L (μm)	445	—533	(503 \pm 21)	490	—648	(545)	484	—601	(557)	419	—564	(500)
a	8.2— 11.4 (10.1 \pm 0.9)			9.4— 11.2 (10.4)			8.3— 13.0 (11.5)			8.8— 13.2 (10.3)		
a'	7.2— 9.5 (8.3 \pm 0.7)			7.8— 9.3 (8.5)			7.3— 9.9 (9.2)			7.3— 8.5 (8.0)		
b	3.4— 3.9 (3.7 \pm 0.1)			3.4— 3.9 (3.6)			3.4— 4.3 (4.0)			3.2— 4.0 (3.6)		
c	36.5—160.0 (62.7 \pm 27.5)			30.9— 82.5 (48.9)			26.6— 56.6 (38.1)			34.6— 61.2 (42.8)		
V	89.9— 94.0 (91.6 \pm 1.1)			89.2— 91.8 (90.4)			91.0— 94.2 (92.3)			89.3— 94.5 (91.5)		
R	34 — 37 (36.2 \pm 1.0)			35 — 40 (37.6)			38 — 42 (40.2)			35 — 39 (36.7)		
RV	4 — 6 (4.8 \pm 0.5)			5 — 6 (5.7)			5 — 7 (5.3)			5 — 6 (5.6)		
Ran	1 — 2 (1.2 \pm 0.4)			1 — 3 (1.8)			2 — 3 (2.4)			2 — 3 (2.3)		
RVan	1 — 3 (2.6 \pm 0.6)			2 — 4 (2.9)			1 — 3 (1.9)			1 — 3 (2.3)		
Rex	12 — 14 (13.4 \pm 0.8)			12 — 14 (12.9)			13 — 15 (14.1)			12 — 14 (12.9)		
RSt	7 — 8 (7.7 \pm 0.5)			6 — 9 (7.4)			6 — 8 (7.3)			7 — 9 (7.9)		
ROes	10 — 11 (10.7 \pm 0.5)			10 — 12 (10.7)			9 — 12 (10.5)			10 — 12 (11.0)		
Stylet (μm)	81.6— 92.4 (87.6 \pm 2.8)			84.1—101.4 (93.1)			84.1— 91.5 (87.7)			79.2— 92.4 (88.0)		
Prorhabdion (μm)	64.3— 70.9 (68.8 \pm 1.9)			66.8— 80.8 (74.7)			64.3— 70.9 (67.6)			62.7— 74.2 (69.2)		
St. K. H. (μm)	3.7— 5.0 (4.2 \pm 0.3)			3.7— 5.3 (4.3)			4.3— 5.3 (4.5)			3.7— 4.7 (4.1)		
St. K. W. (μm)	10.0— 13.2 (11.5 \pm 0.8)			10.7— 13.3 (12.2)			10.3— 12.7 (11.6)			10.7— 12.3 (11.6)		
Ex. pore/L (%)	32.8— 36.8 (34.8 \pm 1.2)			29.6— 36.8 (33.5)			32.6— 36.0 (34.7)			31.4— 37.5 (33.3)		

*Figures indicate minimum and maximum values, and mean or mean \pm s.d. in parentheses.

Locality	Mt. Akagi			Maebashi			Mooka			Nishi-nasuno		
	Gunma Pref.			Gunma Pref.			Tochigi Pref.			Tochigi Pref.		
n	6			10			10			10		
L (μm)	488	—582	(537)	420	—620	(540)	420	—492	(472)	387	—565	(479)
a	9.2— 9.6 (9.4)			9.9— 12.1 (10.9)			8.7— 11.1 (10.0)			9.2— 11.6 (10.1)		
a'	7.4— 8.0 (7.7)			7.7— 10.2 (9.0)			7.0— 8.8 (7.9)			7.4— 8.6 (8.0)		
b	3.7— 4.0 (3.8)			3.4— 4.3 (3.8)			3.1— 3.8 (3.5)			3.2— 4.2 (3.6)		
c	27.2— 43.8 (41.0)			35.5— 89.4 (56.8)			30.7— 57.1 (41.0)			33.9— 64.8 (46.2)		
V	87.4— 90.4 (89.5)			90.8— 94.2 (91.9)			89.3— 92.6 (90.6)			90.2— 94.3 (91.6)		
R	37 — 39 (38.3)			38 — 41 (39.7)			37 — 42 (38.7)			37 — 43 (40)		
RV	6			5 — 6 (5.5)			5 — 6 (5.7)			5 — 6 (5.4)		
Ran	2			1 — 2 (1.7)			1 — 2 (1.9)			1 — 2 (1.7)		
RVan	3			2 — 3 (2.8)			2 — 3 (2.8)			2 — 3 (2.7)		
Rex	13 — 14 (13.3)			13 — 14 (13.9)			13 — 15 (13.7)			13 — 14 (13.5)		
RSt	7 — 8 (7.7)			7 — 9 (7.9)			8 — 9 (8.2)			7 — 9 (8.1)		
ROes	9 — 11 (10.0)			10 — 12 (11.0)			11 — 13 (11.6)			10 — 13 (11.1)		
Stylet (μm)	90.7— 95.7 (93.2)			84.1— 98.1 (91.0)			84.1— 94.0 (87.7)			87.4— 97.3 (92.9)		
Prorhabdion (μm)	71.7— 75.9 (74.4)			66.0— 75.9 (71.3)			64.3— 74.2 (69.1)			71.7— 77.5 (74.2)		
St. K. H. (μm)	3.7— 4.7 (4.1)			3.7— 5.3 (4.7)			4.0— 5.0 (4.3)			3.3— 5.3 (4.4)		
St. K. W. (μm)	10.7— 11.3 (11.2)			10.0— 12.7 (11.2)			10.7— 12.7 (11.6)			9.3— 12.0 (10.9)		
Ex. pore/L (%)	31.8— 36.4 (33.7)			31.8— 36.7 (34.7)			31.5— 37.2 (33.9)			29.0— 34.7 (32.8)		

Table 4. Measurements and dimensions of male and juvenile stages of *Paralobocrionema serratum* (KHAN & SIDDIQI, 1963) n. comb.
(population from Mt. Aso, Kumamoto Pref.)

Stage Sex	Male adult		Fourth stage		Third stage		Second stage	
	Female	Male	Female	Male	Female	Male	Female	Male
n	10	10	10	10	10	2	10	2
L (μ m)	422 - 492 (472)	305 - 360 (340)	345 - 405 (371)	208 - 241 (221)	302 - 305 (183)	157 - 207 (183)	197 - 205	
a	16.9 - 21.1 (18.8)	6.0 - 7.4 (6.6)	8.5 - 9.8 (9.1)	5.8 - 8.7 (6.7)	7.1 - 7.8 (6.8)	6.8 - 8.1 (7.3)	7.6 - 7.9	
a'		7.6 - 10.2 (8.5)	9.6 - 11.8 (10.7)	6.8 - 9.2 (8.1)	8.6 - 9.2 (8.6)	8.0 - 9.8 (8.6)	8.4 - 8.9	
b	4.1 - 4.6 (4.3)	2.7 - 3.3 (3.0)	3.6 - 4.1 (3.9)	2.3 - 2.6 (2.4)	3.2 - 3.4 (2.5)	2.1 - 2.7 (2.5)	2.6	
c	7.0 - 8.8 (7.9)	16.8 - 24.0 (21.0)	7.8 - 11.5 (8.9)	8.3 - 13.4 (10.5)	10.1 - 15.8 (10.9)	9.3 - 11.7 (10.9)	9.8 - 11.9	
c'	2.9 - 4.4 (3.5)							
T	29.7 - 36.2 (32.3)							
R	153 - 173 (161)	39 - 45 (41.1)	43 - 45 (44.5)	44 - 46 (44.8)	45 - 47 (48.6)	47 - 50 (48.6)	48	
Ran	15 - 20 (17.5)	2 - 4 (3.1)	5 - 7 (6.5)	4 - 6 (5.3)	6	5 - 6 (5.1)	5	
Rex	47 - 58 (50.8)	14 - 17 (15.5)	16 - 18 (17.0)	17 - 18 (17.5)	18 - 19 (20.5)	18 - 21 (20.5)	20	
RSt		8 - 11 (9.9)		11 - 13 (12.0)		11 - 15 (13.3)		
ROes		12 - 17 (14.7)	12 - 14 (13.1)	18 - 20 (18.7)	15	19 - 25 (21.8)	20	
Stylet (μ m)		70.0 - 76.0 (74.0)		53.7 - 64.0 (57.9)		39.0 - 41.3 (40.2)		
Prothabdon (μ m)		55.3 - 61.0 (58.4)		42.0 - 46.7 (45.1)		41.3 - 42.7 (30.7)		29.7 - 32.0
St. K. H. (μ m)		3.0 - 3.7 (3.4)		2.7 - 3.3 (3.0)		2.3 - 3.0 (2.6)		
St. K. W. (μ m)		8.7 - 10.3 (9.6)		7.3 - 9.0 (8.3)		5.3 - 6.3 (6.0)		
Ex. Pore/L (%)	27.2 - 31.8 (29.8)	33.1 - 36.8 (35.7)	31.6 - 37.6 (34.3)	37.3 - 42.2 (39.7)	37.8 - 39.1 (38.6)	35.2 - 42.7 (38.6)	38.3 - 39.9	
Spicules (μ m)	49.3 - 51.3 (50.1)							
Gubernaculum (μ m)	8.7 - 10.7 (10.2)							
Scale rows		8 - 11 (9.2)	9 - 10 (9.9)	8 - 9 (8.0)	8			
Genit. Prim. (μ m)		60.0 - 83.3 (74.9)	46.0 - 68.0 (59.7)	11.0 - 14.7 (12.8)	22.7 - 24.0 (8.9)	7.3 - 11.7 (8.9)	11.7 - 12.0	

* Figures indicate minimum and maximum values, and mean value in parentheses.

Table 5. Measurements and dimensions of *Paralobocriconema aberrans*
(JAIRAJPURI & SIDDIQI, 1963) n. comb.

Stage	Adult Female	Juvenile	
		Third stage	Second stage
n	20	1	1
L (μm)	420 — 560 (509 \pm 52)	301	214
a	7.8 — 10.8 (9.5 \pm 0.9)	8.1	8.5
a'	6.4 — 9.1 (7.9 \pm 0.7)	7.5	7.6
b	3.3 — 4.4 (3.9 \pm 0.3)	3.3	3.1
c	23.0 — 66.9 (51.0 \pm 10.5)	43.0	20.0
V	90.8 — 93.6 (91.8 \pm 0.7)		
R	35 — 41 (38.1 \pm 1.6)	52	54
RV	4 — 6 (5.6 \pm 0.6)		
Ran	1 — 4 (1.9 \pm 0.6)	3	5
RVan	1 — 4 (2.8 \pm 0.8)		
Rex	12 — 15 (13.5 \pm 0.9)	18	22
RSt	7 — 8 (7.8 \pm 0.6)		
ROes	10 — 13 (10.9 \pm 0.8)	15	19
Stylet (μm)	81.3 — 91.3 (85.6 \pm 2.8)		37.3
Prorhabdion (μm)	58.7 — 71.3 (65.9 \pm 3.2)	42.0	28.0
St. K. H. (μm)	4.0 — 5.7 (4.5 \pm 0.6)		3.0
St. K. W. (μm)	9.3 — 11.3 (10.1 \pm 0.6)		5.0
Ex. Pore/L (%)	29.7 — 39.6 (33.5 \pm 2.7)	37.0	37.4
Genit. Prim. (μm)		21.3	7.3

* Figures indicate minimum and maximum values, and mean \pm s.d. in parentheses.

Table 6. Measurements and dimensions of female adults of *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb.

Locality	Mt. Aso		Hirakura		Siobara	
	Kumamoto Pref.		Mie Pref.		Tochigi Pref.	
n	25		2		10	
L (μm)	573	— 698 (649 \pm 35)	552	— 558	610	— 762 (701)
a	9.4—	11.6 (10.6 \pm 0.5)	9.3—	9.4	9.9—	11.1 (10.4)
a'	6.7—	8.3 (7.6 \pm 0.4)	7.1		7.4—	8.6 (7.9)
b	3.6—	4.6 (4.0 \pm 0.3)	3.7—	3.8	3.4—	4.1 (3.8)
c	18.1—	46.0 (29.1 \pm 6.2)	22.6—	23.0	16.7—	42.0 (26.1)
V	87.9—	90.5 (89.5 \pm 0.7)	88.2—	89.8	89.8—	92.6 (90.7)
R	51—	56 (53.3 \pm 1.4)	51		52 —	62 (56.8)
RV	6 —	7 (6.5 \pm 0.5)	6 —	7	6 —	7 (6.3)
Ran	2 —	4 (2.6 \pm 0.7)	3		2 —	4 (3.1)
RVan	2 —	4 (2.9 \pm 0.6)	2 —	3	1 —	3 (2.2)
Rex	17 —	21 (18.0 \pm 1.0)	17 —	18	18 —	20 (18.5)
RSt	10 —	11 (10.4 \pm 0.6)	11		10 —	11 (10.8)
ROes	13 —	16 (14.4 \pm 0.9)	14		14 —	16 (15.2)
Stylet (μm)	105.6—	115.5 (110.7 \pm 2.3)	105.6—	108.9	117.1—	128.7 (123.2)
Prorhabdion (μm)	79.2—	85.8 (82.1 \pm 1.9)	89.1—	92.7	90.7—	100.6 (95.0)
St. K. H. (μm)	7.0—	9.3 (8.3 \pm 0.5)	7.3—	7.7	6.7—	8.3 (7.6)
St. K. W. (μm)	16.5—	19.3 (18.0 \pm 0.6)	16.0—	16.7	15.3—	18.0 (16.9)
Ex. Pore/L (%)	29.3—	37.1 (31.2 \pm 1.6)	32.0—	33.5	31.1—	33.8 (32.4)

*Figures indicate minimum and maximum values, and mean values or mean \pm s.d. in parentheses.Table 7. Measurements and dimensions of juvenile stages of *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb. (Population from Mt. Aso)

Stage	Fourth stage		Third stage		Second stage	
n	10		10		10	
L (μm)	419	— 589 (493)	293	— 373 (334)	218	— 253 (232)
a	8.7—	11.1 (10.0)	7.8—	10.0 (9.1)	9.0—	11.5 (10.6)
a'	4.7—	5.7 (5.1)	4.5—	7.1 (5.2)	6.2—	7.5 (7.1)
b	3.1—	4.2 (3.5)	2.9—	3.3 (3.0)	2.3—	2.9 (2.6)
c	13.7—	19.2 (16.3)	9.6—	13.8 (12.4)	9.0—	17.4 (12.1)
R	55 —	60 (57.5)	59 —	63 (61.3)	63 —	69 (66.1)
Ran	4 —	7 (5.4)	5 —	8 (6.2)	4 —	7 (5.3)
Rex	15 —	20 (18.4)	20 —	25 (22.1)	23 —	27 (25.3)
RSt	11 —	13 (11.9)	13 —	17 (14.4)	16 —	18 (17.5)
ROes	16 —	20 (17.6)	19 —	25 (21.8)	25 —	31 (28.2)
Stylet (μm)	89.1—	96.7 (91.6)	66.0—	77.3 (71.8)	50.3—	53.7 (52.1)
Prorhabdion (μm)	66.7—	71.3 (68.9)	49.3—	56.7 (53.9)	37.3—	40.7 (39.1)
St. K. H. (μm)	5.3—	7.0 (6.1)	4.3—	5.7 (4.9)	3.7—	4.3 (3.9)
St. K. W. (μm)	13.0—	16.0 (14.6)	10.7—	12.7 (11.6)	7.7—	8.7 (8.3)
Ex. pore/L (%)	27.6—	34.4 (31.1)	31.7—	36.9 (34.0)	32.3—	36.2 (35.0)
Genit. Prim. (μm)	80.0—	110.0 (95.0)	118.7—	26.0 (21.0)	8.0—	12.0 (10.2)
Scale rows	11 —	15 (13.0)	10 —	13 (11.4)		

*Figures indicate minimum and maximum values, and mean values in parentheses.

日本産ワセンチュウ科の分類学的研究 I. *Neolobocriconema* 属, *Paralobocriconema* 属 (新属) 及び *Macrocriconema* 属 (新属)

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摘 要

日本産ワセンチュウ科 (Cricematidae) のうち, *Neolobocriconema* 属およびその近縁属について分類学的検討を行い, 2 新属 1 新種を含む 3 属 4 種を記載した。三重県美杉村の本木から検出した *Neolobocriconema* 属線虫は, 本属の模式種 *N. laterale* (KHAN & SIDDIQI, 1963) に似るものの, 雌成虫の体長が長い・体環数が多い・尾部が短い・雄成虫が存在する等の特徴から別種と認め, *N. hirakuraense* (新種) と命名した。本種の幼虫も同時に検出し, その形態的特徴は, 従来 *Neolobocriconema* 属とされていた種の幼虫とは大きく異なり, 体環の突起は薄い膜状であった。雌・雄成虫・各幼虫期の形態も加味し, 本属の定義を改定し, 本属には模式種とそれとごく近縁の今回記載された種を入れ, それ以外の *Neolobocriconema* 属とされていた 5 種は, 新たに設けた *Paralobocriconema* 属に移した。

新属 *Paralobocriconema* の雌の特徴としては, 体長 0.34-0.64mm・体環数 39-46・その後縁は鋸歯状あるいは波状・とくに尾部の突起はひだ状となる・submedian lobe の大きさは中程度・陰門は閉じ・尾は 2-3 体環・尾端は丸い等があげられる。雄の総排泄口のある突起は明瞭な瘤状となる。幼虫の体環には円形あるいは四角形の鱗状突起があり, それらは縦に 8-10 列に並ぶ。雄の第 4 期幼虫は口針を欠く。本属の模式種とした *P. serratum* (KHAN & SIDDIQI, 1963) n. comb. は国内に広く分布し, 形態の種内変異は小さかった。雄成虫・幼虫についても計測値を示した。*P. abberans* (JAIRAJURI & SIDDIQI, 1963) n. comb. は今回わが国から初めて, 長野県のリンゴから記録された。

韓国から記載された *Criconema* (*Variasquamata*) *querci* CHOI & GERAERT, 1975 は, 記載後その所属が変わるなど, 分類学的位置が十分に検討されていたとは言えない。走査電子顕微鏡で観察した第 3 期および第 4 期幼虫の形態は, 狭義の *Neolobocriconema* 属の幼虫と似て, 体環の突起は薄い膜状であった。また, 雌成虫・幼虫の submedian lobe は球形で突出し, この点においても *Neolobocriconema* 属に近いが, 雌成虫の体環の付属物は爪状で縦列に並ぶこと・幼虫の体環の突起は不定形で長さも一定でない等の特徴を考慮し, 上記種を模式種として新属 *Macrocriconema* を設けた。日本産の個体群は, 原記載と比べ体長・口針長が短い等の若干の違いは見られるが, その他の形態的特徴は良く一致した。

- Figs. 25-29. *Neolobocriconema hirakuraense* n. sp., female adult. 25, face view; 26, annules of midbody; 27, ornamentation of body annule; 28, posterior body (ventral portion); 29, general view.
- Figs. 30-35. *Neolobocriconema hirakuraense* n. sp., juveniles. 30, fourth-stage juvenile, anterior part; 31, do., posterior part; 32-33, do., face view; 34, do., general view; 35, second-stage juvenile, general view.
- Figs. 36-41. *Paralobocriconema serratum* (KHAN & SIDDIQI, 1963) n. comb. (population of Mt. Aso, Kumamoto), female adult. 36, anterior body; 37, do., with two head annules; 38, posterior body; 39, face view; 40, general view; 41, annules at midbody.
- Figs. 42-49. *Paralobocriconema serratum* (KHAN & SIDDIQI, 1963) n. comb. (population of Mt. Aso, Kumamoto), juveniles. 42, fourth-stage juvenile (female), anterior body; 43, do., posterior body; 44, fourth-stage juvenile (male), anterior body; 45, do. (male), posterior body; 46, do. (female), general view; 47, third-stage juvenile, general view; 48, second-stage juvenile, annules at midbody; 49, do., general view.
- Figs. 50-54. *Paralobocriconema aberrans* (JAIRAJPURI & SIDDIQI, 1963) n. comb., female adult. 50, anterior body; 51, posterior body (ventral view); 52, face view; 53, posterior body (lateral portion); 54, general view.
- Figs. 55-59. *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb., female adult. 55, anterior body; 56, annules at midbody; 57, posterior body (ventral portion); 58, do. (lateral portion); 59, general view.
- Figs. 60-64. *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb., fourth-stage juvenile. 60, face view; 61, anterior body; 62, posterior body; 63, ornamentation of midbody annules; 64, general view.
- Figs. 65-69. *Macrocriconema querci* (CHOI & GERAERT, 1975) n. comb., juveniles. 65, third-stage juvenile, anterior body; 66, do., posterior body; 67, second-stage juvenile, anterior body; 68, do., posterior body; 69, do., general view.

